

REMARKS

This amendment is responsive to the Office Action of August 22, 2008. Reconsideration and allowance of claims 1-5, 9, 12, 18, and 21-32 are requested.

The Office Action

Claims 1 and 9 stand rejected under 35 U.S.C. §112, second paragraph.

Claims 1-3, 9-11, 13-15, 17, and 19 stand rejected under 35 U.S.C. §103 as being obvious over Seeley, et al. (US 6,484,049).

Claims 4, 18, and 20 stand rejected under 35 U.S.C. §103 as being unpatentable over Seeley in view of Simon, et al. (US 6,118,845).

Claims 5 and 16 stand rejected under 35 U.S.C. §103 as being unpatentable over Seeley in view of Erbel, et al. (US2002/0122530).

Claim 12 stands rejected under 35 U.S.C. §103 as being unpatentable over Seeley in view of Ogawa (US 5,572,251).

Background Discussion

By way of brief review, the present application is directed to a novel technique for determining the position of a patient in a reconstructed diagnostic image. In the past, the position of a patient in a diagnostic image has been determined by attaching fiducials or other x-ray opaque markers to the patient or a structure associated with the patient. These x-ray opaque markers are readily apparent in the generated image. For example, if the marking elements are small metal beads, the bead show up as round dots in the generated image. In order to determine the position of the patient, the first step is to identify the candidate markers (see Seeley col., 12, lines 18-20). Locating the individual markers is necessary for the location algorithm of Seeley to function properly. Once the position of the patient is determined, the markers can be mathematically cancelled in the displayed images (see Seeley, col. 13, lines 49-53). Thus, the Seeley technique requires the location of the individual radio opaque markers to be evident in the image.

The present application takes a completely different approach. The present application uses markers which are merely thin dots of metal foil which, while the attenuate the x-ray beam, they attenuate the x-ray beam so little that the individual

markers are not visually evident in the generated image. The computer system does not see or locate the individual markers. Moreover, if the image were displayed to a human viewer, the human viewer would similarly find the individual markers not visually evident. Rather than using an algorithm which is based on determining the location of each individual marker in the diagnostic image, as in Seeley, the present application uses pattern recognition software to recognize the pattern of markers which are not individually visibly evident in the image.

To explain in greater detail, the markers cast very faint shadows which shadows are within the noise level of the x-ray images. Because the shadows cast by the marking elements of the present application are within the noise level, the individual markers are not visibly evident in the image.

Analogous to a digital watermark, the present application uses a pattern recognition process to extract the pattern. Once the pattern has been extracted, the location of the individual markers can be determined. Once the locations of the individual markers are determined from the pattern, one can, like Seeley or Simon, make an appropriate processing correction to the image.

This brief summary is provided by way of example to assist the Examiner in understanding the present application most efficiently and is not intended to limit the scope of the claims in any way.

**The Claims Distinguish Patentably
Over the References of Record**

Claim 1 calls for providing marking elements that individually are not visibly evident to a computer system or a human in a diagnostic image. By contrast, Seeley requires its disclosed marking elements to be individually visible. In the first step of Seeley, the locations of each individual marker are located (col. 12, lines 18-20). If Seeley cannot identify the markers, then the Seeley process cannot be performed and the position of the patient cannot be determined.

Because Seeley works in a materially different way and uses a materially different process, it is submitted that Seeley does not and cannot place the subject matter of claim 1 in the possession of the reader. Accordingly, it is submitted that claim 1 and claims 2-5, 17 and 18 distinguish patentably and unobviously over the references of record.

In order to address the Examiner's 35 U.S.C. § 112 rejection concerning "not visibly evident individually", claim 9 attempts to define a property which can render the marking elements not visibly evident individually. Specifically, claim 9 calls for the marking elements to be of a size, a shape, and a material which exhibit low absorption of the x-rays, the effect of which lies within a noise level of the x-ray image. By contrast, in Seeley, the marking elements must be visible in the reconstructed image, i.e., they must be significantly above the noise level of the x-ray image.

Simon does not cure this shortcoming of Seeley. Simon, like Seeley must locate the individual markers in the generated image, i.e., the effect of the markers in the x-ray image must be significantly above the noise level. That the markers are above the noise level in the generated x-ray image in both Seeley and Simon is further emphasized by each of them disclosing a post processing routine in which, after the markers have been individually found and the patient position determined, the effect of the markers is subtracted out of the displayed image. Thus, the marking elements of both Seeley and Simon must be of a size, a shape, and a material which exhibits a high absorption of x-rays, the effect of which lies well above the noise level of the x-ray image.

It should also be noted that Seeley and Simon can only determine the location of the patient from an image in which the markers are individually visibly evident. Once Seeley or Simon perform the mathematical process to remove the markers from the image, neither Seeley nor Simon can locate the position of the patient from the image.

Accordingly, it is submitted that claim 9 and claims 12 and 21-30 dependent therefrom distinguish patentably and unobviously over the references of record.

New claim 30 uses a third variation in language in order to address the Examiner's 35 U.S.C. § 112 objection. Claim 31 also adds limitations from several of the claim which depend from claims 1 or 9, which details are likely to be found in one advantageous commercial embodiment.

Accordingly, claim 30 and claims 31 and 32-34 dependent therefrom distinguish patentably and unobviously over the references of record.

35 U.S.C § 112

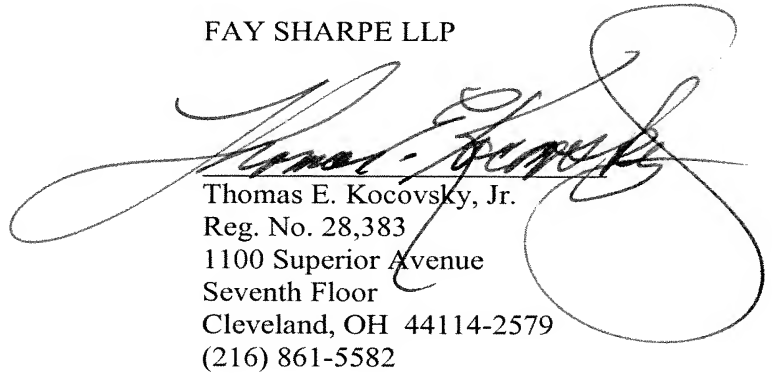
For the reasons set forth above, it is submitted that the amended claims now meet the requirements of 35 U.S.C. § 112.

CONCLUSION

For the reasons set forth above, it is submitted that all claims meet the requirements of 35 U.S.C. § 112 and distinguish patentably and unobviously over the references of record. An early allowance of all claims is requested.

Respectfully submitted,

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